REFERENCE SAMPLE PROGRAM

HAMBURG WHEEL TRACK TESTING OF COMPACTED RUBBERIZED HOT MIX ASPHALT (RHMA)

2018 PROFICIENCY TEST RESULTS

State of California Department of Transportation
Office of Roadway Materials Testing
Materials Engineering and Testing Services
Division of Engineering Services
5900 Folsom Blvd, MS #5
Sacramento, California 95819-4612

January 18, 2019

TABLE OF CONTENTS

1.0 OVERVIEW 3

2.0 ANALYSIS OF TEST RESULTS 4

2.1 EVALUATION CRITERIA 4

2.2 INITIAL TEST 4

2.3 RETEST 5

2.4 OBSERVATIONS 5

3.0 SUMMARY 6

4.0 REFERENCES 6

LIST OF TABLES

TABLE 1: EVALUATION CRITERIA 4

TABLE 2: TEST RESULTS 4

TABLE 3: STATISTICAL ANALYSIS OF TEST RESULTS 5

Appendix A – Initial Test Results

Appendix B – Retest Results

Appendix C – 2nd Retest Results

REFERENCE SAMPLE PROGRAM

HAMBURG WHEEL-TRACK TESTING OF COMPACTED ASPHALT MIXTURES

2018 PROFICIENCY TEST RESULTS

1.0 OVERVIEW

Laboratory proficiency testing is mandated by Federal Highway Administration (FHWA) and a requirement in the Caltrans Independent Assurance (IA) Program. Additionally, proficiency testing ensures that laboratories conducting tests on roadway materials for California Department of Transportation and Federally funded projects are qualified.

In early Nov 2018, the Caltrans Reference Sample Program (RSP) sent out announcements inviting laboratories currently enrolled in the Caltrans RSP to participate in proficiency testing. This round of proficiency test was based on AASHTO T-324, "Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures."

The Hamburg Wheel Track Device (HWTD) is a laboratory device designed to predict the performance of asphalt in the field. While originally developed as a test for evaluating the rut resistance of hot mix asphalt (HMA), the HWTD was found to be a suitable test for evaluating the moisture resistance and overall stability of asphalt mixes. Asphalt pavements may be susceptible to moisture-induced damage, which normally manifests as stripping, which relates to the de-bonding of adhesion between the binder and aggregate. A degradation in these bonds leads to a reduction in strength and stiffness, and ultimately a reduced ability to withstand stress and strain caused by traffic loading. In the case of the HWTD, the test simulates the passage of a wheel over a submerged asphalt sample at elevated temperatures. The deformation caused over the duration of the test can be analyzed to determine whether the mix has suitable moisture resistance.

Caltrans adopted AASHTO T-324, with modifications, to evaluate rutting and moisture susceptibility of HMA pavements.

The material used for this reference sample was a ½ - inch rubberized hot mix asphalt (RHMA) obtained from the Vulcan material plant located in Irwindale, CA. Vulcan was the single source for this material to minimize variability. The target mass for this proficiency sample was to have 4 completely full 8"x8"x4-½" boxes. Instructions were provided to participating laboratories requiring a testing temperature of 122 ˚F (50 ˚C).

The material was sampled from a stockpile in accordance with California Test 125. The stockpile was back dragged and then divided into four equal quadrants. Each sample (4 associated quadrant boxes) is considered an independent and representative sample. Pre-labeled boxes with a unique identifier based on a randomized schematic established by the Reference Sample Program was used for sample distribution.

For this round of proficiency testing 29 laboratories, composed of state and private labs, participated.

2.0 ANALYSIS OF TEST RESULTS

2.1 EVALUATION CRITERIA

Results are evaluated using a statistical evaluation system in which the mean (X) and standard deviation(s) were calculated for each test parameter. A rating score is then applied to the test results based on the criteria shown in Table 1. A test result with a score of 3 or greater are considered an acceptable result. A test result with a score of 2 or less was considered unacceptable and a retest was required.

Laboratories are excluded from the statistical analysis for one of the following reasons: (1) Laboratories results were not submitted by the prescribed deadline or (2) Results were not submitted on the data sheet issued.

Table 1: Evaluation Criteria

Test Result	Rating	Interpretation of Results	Acceptance
X ± 1.0s	5	Very Good	Acceptable
X ± 1.5s	4	Good	
X ± 2.0s	3	Fair	
X ± 2.5s	2	Poor	Unacceptable
X ± 3.0s	1	Very Poor	

2.2 INITIAL TEST

Twenty-nine laboratories participated in the initial test. Analysis for outliers was performed in accordance with ASTM E 178 “Standard Practice for Dealing with Outlying Observation.”

Table 2 summarizes the initial test results with outliers. Of the 29 laboratories, 1 laboratory was determined to be outliers.

Table 2: Test Results

Sample	# of Labs	Initial Failures		Passing Labs
		Failure Count (Lab ID)	Outlier Count (Lab ID)	
AASHTO T-324	29	32, 161	161	27

The initial test analysis results are in Table 3 at 20,000 passes. Detailed test results are in Appendix A.

Table 3: Statistical Analysis of Test Results

Sample	# of Labs	Average Rut Depth (mm)	Standard Deviation	Number of Labs Achieved Score of				
				5	4	3	2	1
AASHTO T-324	29	3.494	1.382	24	2	1	1	1
% of Total				83	8	3	3	3

2.3 RETEST

This round of proficiency test required further testing. Laboratories 32 and 161, respectively, received unacceptable results during the initial round of testing and were both given the option to retest. Laboratory 32 failed to achieve acceptable results during the retest. Laboratory 161 however successfully achieved satisfactory results. The average rut depth for this proficiency sample was 3.494 mm laboratory 32 reported a rut depth values of 7.66 mm. See Appendix B for the retest results.

Table 4: Statistical Analysis of Retest Results

Sample	# of Labs	Average Rut Depth (mm)	Standard Deviation	Number of Labs Achieved Score of				
				5	4	3	2	1
AASHTO T-324	1	3.494	1.382	1	0	0	0	1
% of Total				50	0	0	0	50

2.4 2ND RETEST RESULTS

Laboratory 32 scored unacceptable during the retest and was permitted a 2nd retest with a Caltrans Independent Assurance (IA) representative present. Caltrans IA representative witnessed laboratory 32 perform a 2nd retest. The results were not in the acceptable range. The IA representative was unable to determine the cause for the deficiency. The 2nd retest results are reported in appendix C.

2.5 OBSERVATIONS

For this proficiency testing, only the highest value between the left and right wheel track at 20,000 passes were considered. 18 of the 29 participating laboratories the left wheel tracked

yielded the higher value. Laboratories CTID# 2, 3, 5, 6, 8, 10, 11, 32, 75, 160, 161, 193, 273, 361, 413, 441, 551, and C the left wheel tracked yielded the higher value.

Possible causes for variation in the data may be attributed to:

- Not following proper test procedure/s or best practice (i.e., inaccurate water temperature
- Equipment out of calibration
- Varying equipment manufactures

3.0 SUMMARY

A total of 29 laboratories participated in this proficiency testing of AASHTO T-324 Hamburg Wheel Track Test for the ½" rubberized hot mix asphalt. Scores of "Acceptable" were given to 28 of the participating 29 laboratories. The remaining laboratory 32 failed to achieve acceptable results for this proficiency test sample. Laboratory 32 failed the initial, retest, and the 2nd retest.

For this proficiency testing we considered only the highest value between the left and right wheel track at 20,000 passes. This in turned allowed for the worst-case rut depth to be evaluated. Results concluded that we had an average rut depth of 3.494 mm. The maximum and minimum rut depth noted was 9.700 and 1.395 mm respectively.

4.0 REFERENCES

AASHTO T-324, "Standard Method of Test of Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)"

ASTM E178 – 80, "Standard Practice for Dealing with Outlying Observations"

Caltrans, "Independent Assurance Manual," Sacramento, July 2005.

APPENDIX A

Results from Initial Test

CTID	L-Track	R-Track	Max Wheel Track	Rating
1	4.37	3.44	4.37	5
2	2.4	2.1	2.4	5
3	2.8	1.94	2.8	5
5	2.25	1.92	2.25	5
6	3.84	3.4	3.84	5
8	3.65	3.05	3.65	5
10	3.96	3.17	3.96	5
11	3.91	3.91	3.91	5
32	7.66	6.82	7.66	1
59	2.21	2.31	2.31	5
75	3.12	2.64	3.12	5
103	2.53	4.27	4.27	5
160	3.52	2.2	3.52	5
**161*	*8.09*	*9.7*	*9.7*	*1*
183	2.454	3.209	3.209	5
192	1.84	2.18	2.18	5
193	3.63	2.544	3.63	5
273	2.16	2.02	2.16	5
284	1.72	2.41	2.41	5
297	4.24	4.24	4.24	5
356	2.66	3.05	3.05	5
361	4.1	2.82	4.10	5
413	1.395	1.096	1.395	3
441	1.941	1.623	1.941	4
454	4.737	6.813	6.813	2
464	2.492	3.039	3.039	5
551	5.21	3.94	5.21	4

APPENDIX B

Results from Retest

CTID	L-Track	R-Track	Max Wheel Track	Rating
32	7.66	6.82	7.66	1
161	2.66	2.47	2.66	5

APPENDIX C

Results from 2nd Retest

CTID	L-Track	R-Track	Max Wheel Track	Rating
32	7.32	5.22	7.32	1